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PATENT APPLICATION
Attorney's Docket No.: 3799.1003-000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Joachim Kiefer and Oemer Uensal

Application No.: 10/506,622 Group 1796

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Confirmation No.: 5172

For: MIXTURE COMPRISING SULPHONIC ACID CONTAINING VINYL, POLYMER ELECTROLYTE MEMBRANE COMPRISING POLYVINYLSULPHONIC ACID AND THE USE THEREOF IN FUEL CELLS

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AMENDMENT

Mail Stop RCE
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Sir:

This Amendment is being filed in response to the Office Action mailed from the U.S. Patent and Trademark Office on February 14, 2008 in the above-identified application. Reconsideration and further examination are requested.

A Request for Continued Examination is being transmitted herewith. A Petition for Extension of Time and the appropriate fee are being filed concurrently with this Amendment.

Please amend the application as follows.

Amendment to Claims

Please amend Claims 20 and 30. Please cancel Claims 32-38 and 40. Please add new Claims 41-50. The Claim Listing below will replace all prior versions of the claims in the application.

Claim Listing

1-19. (Cancelled)

20. (Currently Amended) A proton-conducting polymer membrane which is based on polyvinylsulphonic acid and is obtained by a process comprising the steps of:

a) mixing a polymer, said polymer having solubility of at least 1% by weight in a vinyl-containing sulfonic acid, with a vinyl-containing sulphonic acid, and vinyl-containing phosphonic acid,

b) forming a flat structure using the mixture from step a) on a support,

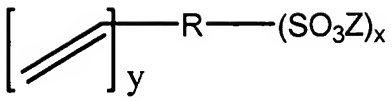
c) polymerizing the vinyl-containing sulphonic acid and the vinyl-containing phosphonic acid present in the flat structure from step b), thereby forming an interpenetrating network,

wherein the product obtained in step (c) comprises at least 10% by weight of polyvinyl-containing phosphonic acid, and

characterized in that the membrane has an intrinsic conductivity of at least 0.001 S/cm at 160 °C.

21. (Previously presented) The membrane of Claim 20, characterized in that the polymer used in step a) is a high-temperature-stable polymer containing at least one nitrogen, oxygen, or sulphur atom in one repeating unit or in different repeating units.

22. (Previously presented) The membrane of Claim 20, characterized in that one or more polyazoles and/or polysulphones are used in step a).



where

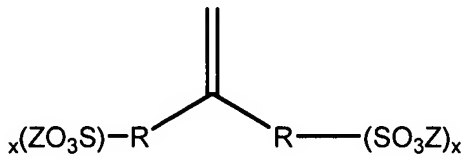
R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radications optionally substituted by halogen, -OH, COOZ, -CN, or NZ_2,

Z are each, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN,

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, and

y is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



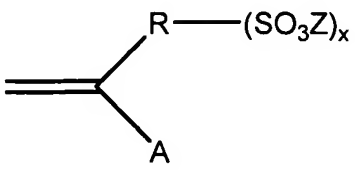
where

R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z are each, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN, and

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



where

A is a group of the formula $COOR^2$, CN, $CONR^2_2$, OR^2, or R^2, where R^2 is hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

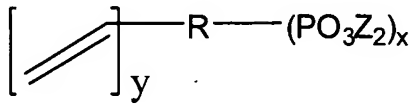
R is a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkylenoxy group, or a divalent C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z are each, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN, and

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

24. (Previously presented) The membrane of Claim 20, characterized in that the mixture prepared in step a) comprises vinyl-containing phosphonic acid.

25. (Previously presented) The membrane of Claim 24, characterized in that the mixture prepared in step a) contains compounds of the formula



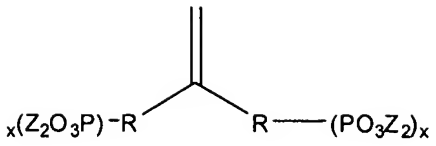
where

R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z are each, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN,

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, and

y is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or the formula



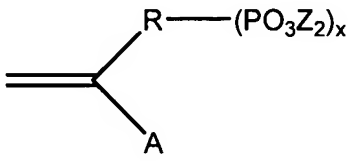
where

R is a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z are each, independently of one another, hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN, and

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



where

A is a group of the formula $COOR^2$, CN, $CONR^2_2$, OR^2, or R^2, where R^2 is hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethylenoxy group, or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

R is a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkylenoxy group, or a divalent C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z are each, independently of one another, hydrogen , a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleonoxy group or C5-C20 aryl or heteroaryl group, with the above radicals optionally substituted by halogen, -OH, -CN, and

x is 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

26. (Previously presented) The membrane of Claim 24, characterized in that the weight ratio of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid is in the range from 1:100 to 99:1.

27. (Cancelled)

28. (Previously presented) The membrane of Claim 20, characterized in that the polymerization in step c) is effected by means of a substance which is capable of forming free radicals.

29. (Previously presented) The membrane of Claim 20, characterized in that the polymerization in step c) is carried out by irradiation with IR light, NIR light, UV light, ß-rays, γ-rays, or electron beams.

30. (Currently Amended) The membrane of Claim 20, characterized in that the membrane comprises from 1 to 90% by weight of the polymer and from 99 to 0.5% by weight of polyvinyl-containing sulphonic acid.

31. (Previously presented) The membrane of Claim 20, characterized in that the membrane has a layer comprising a catalytically active component.

32-40. (Cancelled)

41. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 20% by weight of a vinyl-containing phosphonic acid.

42. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 30% by weight of a vinyl-containing phosphonic acid.

43. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 50% by weight of a vinyl-containing phosphonic acid.

43. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 50% by weight of a vinyl-containing phosphonic acid.

44. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 5% by weight of a vinyl-containing sulfonic acid.

45. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises at least 10% by weight of a vinyl-containing sulfonic acid.

46. (New) The membrane of Claim 20, wherein the mixture obtained in step (a) comprises between 10% by weight and 97% by weight of a vinyl-containing sulfonic acid.

47. (New) The membrane of Claim 20, wherein the product obtained in step (c) comprises from 1% by weight to 70% by weight of polyvinyl-containing sulfonic acid.

48. (New) The membrane of Claim 20, wherein the product obtained in step (c) comprises from 5% by weight to 50% by weight of polyvinyl-containing sulfonic acid.

49. (New) The membrane of Claim 20, wherein the product obtained in step (c) comprises from 20% by weight to 95% by weight of polyvinyl-containing phosphonic acid.

50. (New) A proton-conducting polymer membrane which is based on polyvinylsulphonic acid and is obtained by a process comprising the steps of:

a) mixing a polymer, said polymer having solubility of at least 1% by weight in a vinyl-containing sulfonic acid, with a vinyl-containing sulphonic acid, and vinyl-containing phosphonic acid,

b) forming a flat structure using the mixture from step a) on a support,

c) polymerizing the vinyl-containing sulphonic acid and the vinyl-containing phosphonic acid present in the flat structure from step b), thereby forming an interpenetrating network,

wherein the product obtained in step (c) comprises from 0.5% to 99% by weight of polyvinyl-containing sulfonic acid and between 20% and 95% by weight of polyvinyl-containing phosphonic acid, and

characterized in that the membrane has an intrinsic conductivity of at least 0.001 S/cm at 160 °C.